

Appl. No. 09/988,579
Reply to Office Action of October 20, 2003

Attorney Docket: P67299US0

Amendments to the Claims:

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The listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

Claim 1 (previously presented): An aqueous acidic solution for forming a conversion coating on the surface of a metallic material, said solution containing at least one rare earth element containing species, an accelerator additive selected from the group consisting of Cu, Ag, Sn, Pb, Sb, Bi, Se and Te, a peroxidic species and at least one acid selected from the group consisting of mineral acids, carboxylic acids, sulphonic acids and phosphonic acids, and a total chloride concentration within the range of from 30 to 1500 mg/litre, wherein said solution contains no more than 20 mg/litre each of fluoride and of phosphate, and the solution is substantially free of chromate.

Claim 2 (previously presented): The solution of claim 1, wherein said total chloride concentration is from 50 to 1500 mg/litre.

Claim 3 (cancelled)

Claim 4 (original): The solution of claim 1, wherein the solution contains only one accelerator additive.

Claim 5 (original): The solution of claim 1, wherein the accelerator additive is Cu, preferably at a concentration from 0.01 to 5 mmol/litre.

Claim 6 (previously presented): The solution of claim 1, wherein the at least one acid is selected from the group consisting of sulphuric acid, sulphamic acid, hydrochloric acid,

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nitric acid, perchloric acid, carboxylic acids, alkyl sulphonic acids, aryl sulphonic acids, alkyl phosphonic acids and aryl phosphonic acids.

Claim 7 (original): The solution of claim 1, wherein said at least one rare earth element containing species comprises ions and/or complex species of a mixture of REE wherein the ratio of cerium to total REE is at least 5% by weight, preferably at least 30% by weight, more preferably at least 60% by weight.

Claim 8 (original): The solution of claim 1, wherein the concentration of rare earth element containing species is in the range of 0.5 to 1000 g/l, preferably from 1 to 60 g/l, more preferably from 2 to 30 g/l.

Claim 9 (previously presented): The solution of claim 1, wherein the rare earth elements are introduced into the coating solution in the form of a soluble salt selected from the group consisting of cerium (III) containing chloride, cerium (III) containing sulphate, cerium (III) containing sulphamate, cerium (III) containing nitrate, cerium (III) containing perchlorate and cerium (III) containing methanesulphonate, preferably said soluble salt is formed by reaction of cerium carbonate with an appropriate acid.

Claim 10 (original): The solution of claim 1, wherein said rare earth element is cerium, present at a concentration in the range from 0.01 to 0.5 mol/litre.

Claim 11 (previously presented): The solution of claim 1, wherein said peroxidic compound is selected from the group consisting of peroxo acids, peroxo salts and peroxo compounds, and is preferably hydrogen peroxide.

Claim 12 (original): The solution of claim 1, wherein the amount of the peroxidic compound, calculated as equivalent amount of hydrogen peroxide, is in the range from 1 to 200 g/l, preferably 1 to 100 g/l, more preferably 2 to 50 g/l, more preferably 3.4 to 34 g/l.

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Claim 13 (original): The solution of claim 1, wherein the concentration of at least one said accelerator additive is in the range from 0.0001 to 1.2 g/l, preferably from 0.001 to 1 g/l, more preferably from 0.005 to 0.1 g/l, more preferably from 0.01 to 0.06 g/l.

Claim 14 (original): The solution of claim 1, wherein the total concentration of the accelerator additive is from 0.0001 to 0.15 g/l.

Claim 15 (original): The solution of claim 1, wherein the accelerator additive is in a concentration range from 0.01 to 5 mmol/litre, preferably from 0.02 to 5 mmol/litre.

Claim 16 (original): The solution of claim 1, wherein the accelerator additive is present in solution as a complexed species, wherein the complexing agent is preferably an amino carboxylic acid, such as glycine, alanine and/or glycine ethyl ester, ethylenediaminetetraacetic acid (EDTA), nitriloacetic acid (NTA), hydroxyethylenediaminetriacetic acid (HEDTA) and/or corresponding salts thereof, more preferably glycine.

Claim 17 (original): The solution of claim 1, wherein the accelerator additive is present in solution as an uncomplexed species.

Claim 18 (original): The solution of claim 1 having a pH value from 1.0 to 2.9, preferably from 1.7 to 2.5, more preferably from 1.9 to 2.2.

Claim 19 (original): The solution of claim 1, wherein the metallic material is aluminium or aluminium alloy and the solution contains not more than 500 mg/l nitrate content, preferably not more than 300 mg/l, more preferably not more than 200 mg/l, particularly preferred not more than 50 mg/l.

Claim 20 (original): The solution of claim 1, wherein the rare earth element is cerium, said accelerator additive is copper and said peroxidic species is a peroxidic compound, said

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solution further containing sulphate and/or sulphamate species and at least 50 mg/l of chloride.

Claim 21 (original): The solution of claim 1, wherein said rare earth element is cerium and said peroxidic species is hydrogen peroxide.

Claims 22 – 33 (cancelled)

Claim 34 (currently amended): The concentrate of claim 33, further including A liquid acidic aqueous concentrate for the make-up of an aqueous acidic solution, wherein said concentrate includes at least 125 g/litre of at least one total rare earth element containing species; an accelerator additive selected from the group consisting of metals of Groups IB, IIB, IVA, VA, VIA and VIII of the Periodic Table, preferably selected from the group of Cu, Ag, Sn, Pb, Sb, Bi, Se and Te, preferably Cu; a peroxidic species; at least one acid selected from the group consisting of mineral acids, carboxylic acids, sulphonic acids and phosphonic acids; a total chloride concentration within the range of from 30 to 1500 mg/litre; no more than 100 mg/litre each of fluoride and of phosphate; and said concentrate is substantially free of chromate.

Claims 35 – 38 (cancelled)

Claim 39 (currently amended): A liquid acidic aqueous concentrate for the replenishing of an aqueous acidic solution according to claim 1 for forming a conversion coating on the surface of a metallic material, said concentrate containing at least one rare earth element containing species; at least one accelerator additive selected from the group consisting of Cu, Ag, Sn, Pb, Sb, Bi, Se and Te and anions such that the molar ratio of the sum of the elements in this group : anions is in the range from 1 : 50 to 1 : 10,000; a peroxidic species; at least one acid selected from the group consisting of mineral acids, carboxylic acids, sulphonic acids and phosphonic acids; a total chloride concentration within the range

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of from 30 to 1500 mg/litre; no more than 20 mg/litre each of fluoride and of phosphate;
and said concentrate is substantially free of chromate.

Claims 40 – 43 (cancelled)

Claim 44 (previously presented): An aqueous acidic solution for forming a conversion coating on the surface of a metallic material, said solution containing at least one rare earth element containing species, ~~an accelerator additive selected from the group consisting of~~ metals of Groups IB, IIB, IVA, VA, VIA and VIII of the Periodic Table, a peroxidic species and at least one acid selected from the group consisting of mineral acids, carboxylic acids, sulphonic acids and phosphonic acids, and a total chloride concentration within the range of from 30 to 1500 mg/litre, wherein said solution contains no more than 20 mg/litre each of fluoride and of phosphate, and the solution is substantially free of chromate, wherein said solution contains no significant amount of Fe and no intentional addition of Fe to the solution.

Claim 45 (previously presented): The solution of claim 44, wherein the solution contains a maximum Fe content of about 5 mg/litre.